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## Air Warfare's Holy Grail: A 'Single Integrated Picture'

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The Defense Department is spending several hundred million dollars yearly on programs designed to produce a so-called "single integrated air picture." The elusive SIAP would make it possible for all U.S. military services and allies to share a graphic representation of the airspace around the theater of war.

A SIAP would provide a single track for each enemy target, using data generated by multiple surface and air sensors and broadcast via Link 16 — an information distribution system for communication, navigation, and identification data.

A common air picture for all the services is not difficult to realize, experts said. One problem, however, is that the services have yet to agree on what SIAP-related technologies best meet their needs.

These experts agreed that, in the SIAP world, things are improving, thanks to the increased use of Link 16.

To gather raw data about the quality and the "jointness" of the air picture, the Defense Department conducts an annual exercise called the Joint Combat Identification Evaluation Team (JCIET).

At JCIET, commanders see a variety of air pictures. One may be from the Army's Patriot air-defense system. Another may be the air picture from the Air Force AWACS air-traffic control aircraft. At the 2002 exercise, two Navy cruisers, a Marine Corps radar and a Navy reconnaissance aircraft relied on the air picture generated by the Cooperative Engagement Capability (CEC), a sensor-netting system.

Each platform participating in JCIET tracks and identifies friendly and enemy aircraft, as well as incoming cruise missiles. Ballistic missile defense is not part of the drill.

During the exercise, analysts figure out when an incorrect ID is made and determine whether that led to friendly fire. During the past decade, eight large-scale JCIET events were held to assess how well combat ID and air picture information are shared among the services.

There are two parts to achieving a SIAP, explained Bruce Behrens, a JCIET analyst at the Center for Naval Analyses. "First, aircraft must be detected and identified. Then that information must be shared with the rest of the service and coalition participants.

"One reason the air picture has improved over the years is the increasing proportion of PPLI-equipped aircraft," Behrens said. PPLI stands for precise participant location and identification. Aircraft with PPLI identify themselves as friendly and report their own position, he said, "making it much less likely that they will be incorrectly identified as hostile. ... Distinguishing between neutral and hostile aircraft is probably the hardest combat ID challenge, because even when the aircraft type can be identified, the intent of the pilot may have to be considered."

Another improvement in recent years, Behrens added, is the replacement of "legacy Link-11 systems with native Link-16 systems." The new systems speak the same language, allowing more data to be shared more accurately.

The Defense Department's SIAP office has spent at least the last two years working on the integration of the Link 16 data. The problem with Link 16, experts said, is that sometimes it produces dual tracks or multiple tracks for the same target. CEC advocates, meanwhile, claim that CEC fixes the problem by creating a single track that makes it easier for commanders to pinpoint the target and figure out how to defeat it. A JCIET official said that the ships equipped with CEC potentially end up with two different pictures: the Link 16 picture and the CEC picture.

"Links have dual tracks, they swap tracks, they drop tracks," said Tony Gecan, senior systems engineer at Raytheon Co., the prime contractor for CEC. While trying to maintain combat ID on targets with data links, Gecan said, "Operators spend a lot of time trying to figure out what they are looking at."

During JCIET, he explained, Raytheon merged the CEC tracks with the data link tracks via a "fusion engine that can suck out duals from the data links." The end result, he said, is a "very clear picture."

The CEC collected information from AWACS, over Link 16 and from Patriot, over commercial FAA radar. "We fused that into one track, one ID per target. That's the SIAP," said Gecan. "The Navy then distributed the ID over Link 16 to all the other users." The users would not necessarily know whether it's a Link 16 or a CEC track.

But one JCIET official noted that, no matter what technology is being used, combat ID always involves a “judgment call.” After 9/11, for example, nobody will want to assume that every commercial airliner is necessarily friendly, he said.